



(11) (A) No. 1 234 656

(45) ISSUED 880405

(52) CLASS 8-93.71

(51) INT. CL. D06M 13/18⁴

(19) (CA) **CANADIAN PATENT** (12)

(54) Process for Producing Hydrophilic Nylon Fabric

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(73) Granted to Du Pont Canada Inc.
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(21) APPLICATION No. 456,955

(22) FILED 840619

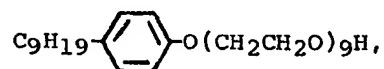
NO. OF CLAIMS 6 - NO DRAWING

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ABSTRACT OF THE DISCLOSURE

5 A process for producing hydrophilic nylon fabric is disclosed. The process comprises treating nylon fibre in fabric form with a nonionic surfactant of the formula:



10 said surfactant having a cloud point in the range of from 53°C to 56°C. The process is particularly useful for making knitted nylon fabrics hydrophilic and hence suitable for use in underwear and other garments where absorption of perspiration is desired.

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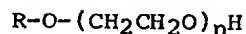
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PROCESS FOR PRODUCING HYDROPHILIC NYLON FABRIC

The present invention relates to a process for producing hydrophilic nylon fabric in which the hydrophilic nature of the fabric is reasonably stable to washing.

Nylon yarn has good mechanical properties, for example strength etc., but its poor hydrophilic property, compared to cotton, for example, makes its use undesirable in fabrics used to make underwear or other garments where absorption of perspiration is desired.

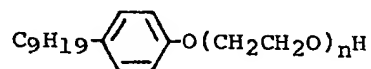
The production of hydrophilic nylon fibre is known in the prior art. For example, Japanese Patent application 53-70123 of K. Nishijima, published 1978 June 22, discloses adding polyethylene oxide to nylon polymer, spinning the polymer to produce a fibre and thereafter treating the fibre in fibre or fabric form with a compound represented by the following formula:



where R is a saturated or unsaturated hydrocarbon group or alkyl phenol group having 8-18 carbon atoms and n is a positive integer of 3 to 20.

The above prior art method for making hydrophilic nylon fibre is satisfactory in instances where the fibre may be conveniently spun from nylon polymer containing polyethylene oxide. However, the method does not appear to be intended for the situation where the nylon fibre has already been spun from nylon polymer containing no polyethylene oxide.

It has now been found that nylon fibre which has been spun from nylon polymer, containing no polyethylene oxide, may be made hydrophilic by treating the fibre in fabric form with a nonionic surfactant of the formula:



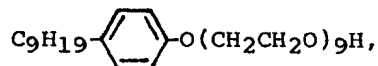
where n denotes the number of moles of ethylene oxide per



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mole of nonylphenol and wherein n is 9.

Accordingly the present invention provides a process for producing hydrophilic nylon fibre, said process comprising treating a nylon fibre in fabric form with a nonionic surfactant of the formula:



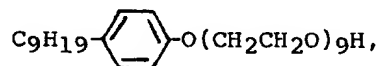
said surfactant having a cloud point in the range of from 53°C to 56°C.

As used herein, cloud point is the temperature at which a 1% by weight solution of a nonionic surfactant in water becomes cloudy, i.e. a second phase appears, upon heating due to the onset of insolubility.

In an embodiment of the process of the present invention, the fabric is treated with a solution of 0.05% to 1.0%, by weight, of said surfactant in water.

In another embodiment of the process of the present invention, the fabric is dyed, and dried or heat set and the treating of the fabric with said surfactant is carried out after the dyeing step but prior to the drying or heat setting step.

The present invention also provides a hydrophilic nylon fabric, said fabric having been treated with a nonionic surfactant of the formula:



said surfactant having a cloud point in the range of from 53°C to 56°C.

In an embodiment of the hydrophilic nylon fabric of the present invention, the fabric has been treated with a solution of 0.05% to 1.0%, by weight, of said surfactant in water.

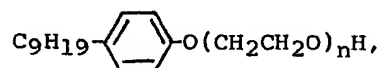
In a further embodiment of the hydrophilic nylon

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fabric of the present invention, the fabric has been dyed, and dried or heat set and the treating of the fabric with said surfactant has been carried out after the dyeing but prior to the drying or heat setting of the fabric.

5 Nylon fabrics of the present invention may be manufactured from fibres of nylon polymers prepared from polymerizable diamines and dicarboxylic acids, monoamine monocarboxylic acids, or their amide-forming derivatives. Preferably, the nylon polymers used in the present invention
10 are the homopolymers known as nylon 6, nylon 66 and co-polymers containing the monomers of such homopolymers as the major component.

 The nonionic surfactant used to treat nylon fabric to make it hydrophilic according to the present
15 invention is of the formula:



where n is 9. As is exemplified hereinafter, it is
20 important that n=9. For n=9, the nonionic surfactant has a cloud point, as defined hereinbefore, in the range of from 53°C to 56°C. If n is lower than 9 the cloud point of the surfactant is 30°C or less and the surfactant is less useful, perhaps because it is insufficiently soluble in
25 water. If n is greater than 9, the cloud point of the solution is at least 65°C and the surfactant is less useful, perhaps because it is too soluble in water.

 The treatment of the fabric may be carried out on the fabric or on sewn products made from the fabric. Pre-
30 ferably the fabric is treated with a solution of 0.05% to 1%, by weight, of the nonionic surfactant in water. It is preferred that the nonionic surfactant be added in the last rinse or pad prior to drying or heat setting of the fabric. If the fabric is dyed, it is also preferred that the
35 treatment with the nonionic surfactant follow the dyeing

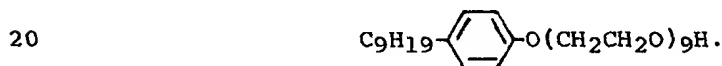
operation. The nonionic surfactant may be added conveniently, at room temperature e.g. 25°C-40°C, after dyeing of the fabric either in the last rinse or in a pad, prior to the drying and/or the heat setting of the fabric at a temperature in the range of from 150°C to 205°C.

The process of the present invention is particularly useful for making knitted nylon fabrics hydrophilic and hence suitable for use in underwear and other garments where absorption of perspiration is desired.

The present invention is illustrated by the following examples:

EXAMPLE 1

A 150 dtex, 34 filament, semi-dull, nylon 66 yarn was knitted into a circular knit tricot fabric. The fabric was dyed according to a conventional method. The dyed fabric was then dipped in a pad bath containing 0.1% by weight solution (in water) of the nonionic surfactant:



This nonionic surfactant is available from Domtar Inc. at, 104 Doyon Avenue, Pointe Claire, Quebec, H9R 3T5, as IGEPAL* CO-630 surfactant. The cloud point of IGEPAL CO-630 surfactant is in the range of from 53°C to 56°C. The fabric was then wrung out and dried at a temperature of 170°C for 1 minute to obtain the treated fabric.

The hydrophilic property of the surfactant-treated fabric was compared to that of a fabric treated in the same way except that no surfactant was added (control fabric) by carrying out a so-called "wicking test".

Wicking Test

A 2.5 cm by 15 cm test strip is cut from the fabric in both the length and width directions. A line is drawn 2.5 cm from the bottom of each of the resultant two

*denotes trade mark.

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15 cm long test strips. The bottom of each test strip is submerged to the 2.5 cm mark in 25°C distilled water. After 3 minutes the height to which the water has wet the fabric above the 2.5 cm mark is recorded. The average of the two results is the "wicking height" for the fabric.

The IGEPAL CO-630 treated fabric was then subjected to five domestic washings. Each washing was carried out according to the American Association of Textile Chemists and Colorists (AATCC) Test Method 61-1980 entitled "Color Fastness to Washing (Domestic)".

The wicking test was also carried out on the washed fabric.

The results are shown in Table 1.

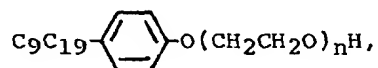
Table 1

	WICKING HEIGHT (cm)	
	Before Washing	After 5 Washings
IGEPAL CO-630 surfactant treated fabric	6.0	5.5
Control fabric	2.5	3.0

It may be observed from Table 1, that the fabric treated with IGEPAL CO-630 surfactant according to the present invention had a good hydrophilic property before washing and retained most of its hydrophilic property after 5 washings.

EXAMPLE II

As a comparison, 150 dtex, 34 filament, semi-dull, nylon 66 yarn was knitted into a circular knit tricot fabric and the fabric was treated in the same manner as in Example I except that in the formula



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for the nonionic surfactant, n was equal to 8-9. This surfactant is also available from Domtar Inc., as IGEPAL CO-610 surfactant. The cloud point of IGEPAL CO-610 surfactant is 30°C.

5 The results are shown in Table 2.

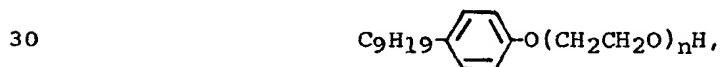
Table 2

10		WICKING HEIGHT (cm)	
		Before Washing	After 5 Washings
	IGEPAL CO-610 surfactant treated fabric	5.0	4.0
15	Control fabric	2.5	3.0

It may be observed from a comparison of Table 2 with Table 1 of Example I that the fabric treated with IGEPAL CO-610 surfactant (which is not within the scope of the present invention) exhibited a poorer hydrophilic property both before and after 5 washings than did the fabric treated with IGEPAL CO-630 according to the present invention.

EXAMPLE III

25 As a further comparison, a 150 dtex, 34 filament, semi-dull nylon 66 yarn was knitted into a circular knit tricot fabric and the fabric was treated in the same manner as in Example I except that in the formula



for the nonionic surfactant, n was equal to 10-11. This surfactant is also available from Domtar Inc., as IGEPAL CO-710 surfactant. The cloud point of IGEPAL CO-710 surfactant is in the range of from 70°C to 72°C.

The results are shown in Table 3.

Table 3

5		WICKING HEIGHT (cm)	
		Before Washing	After 5 Washings
	IGEPAI CO-710 surfactant treated fabric	5.0	4.0
10	Control fabric	2.5	3.0

It may be observed from a comparison of Table 3 with Table 1 of Example I that the fabric treated with IGEPAI CO-710 surfactant (which is not within the scope of the present invention) exhibited a poorer hydrophilic property both before and after 5 washings than did the fabric treated with IGEPAI CO-630 according to the present invention.

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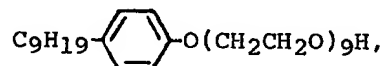
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The embodiments of the invention is which an exclusive property or privilege is claimed are defined as follows:

1. A process for producing hydrophilic nylon fibre, said process comprising treating nylon fibre in fabric form with a nonionic surfactant of the formula:

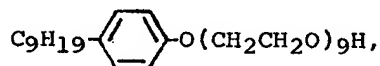


said surfactant having a cloud point in the range of 53°C to 56°C.

2. The process according to Claim 1, wherein the fabric is treated with a solution of 0.05% to 1.0%, by weight, of said surfactant in water.

3. The process according to Claim 2, wherein the fabric is dyed, and dried or heat set and the treating of the fabric with said surfactant is carried out after the dyeing step but prior to the drying or heat setting step.

4. A hydrophilic nylon fabric, said fabric having been treated with a nonionic surfactant of the formula:



said surfactant having a cloud point in the range of from 53°C to 56°C.

5. The hydrophilic nylon fabric according to Claim 4 wherein the fabric has been treated with a solution of 0.05% to 1.0%, by weight, of said surfactant in water.

6. The hydrophilic nylon fabric of Claim 5 wherein the fabric has been dyed, and dried or heat set and wherein the treating of the fabric with said surfactant has been carried out after the dyeing but prior to the drying or heat setting of the fabric.



SUBSTITUTE

REMPLACEMENT

SECTION is not Present

Cette Section est Absente